Well, thank you Phil, and thank you John, for those kind words. It is just a wonderful honor. And thank you to the Waggoner family and distinguished guests and colleagues who came here today. You know I--it has been a wonderful day thus far. I cannot remember spending so many consecutive hours with psychiatrists and not having to pay for it. So I am very delighted by that. Phil asked me to mention that there are ethical components to this. So I will say the word ethics. Ethics. Ethics and values. There was a Norman Fost who was a pediatrician--he is a pediatrician anesthetist, once said, “You know if you took all the medical ethicists in the world and laid them end to end, that would be a good thing.” You could say that about medical historians as well.

This work that I will be talking about today--I have several colleagues in the back. Dr. Alexander Stern, Dr. J. Alex Navarro, and Alexandra Sloan who are working with me on this project. I would be remiss--I am the front man, but they have been working on this project as well. This really just snow balled. It really began as Phil mentioned, I have been looking at issues like quarantines and epidemics for almost twenty years, but really the history of
them with the hopes that they would have some implications for public policy, but after a few years, not really expecting that to happen.

About a year and a half ago over just before the July 4th weekend, a gentleman from the Department of Defense called me. This was a physician and who worked for the Defense Threat Reduction Agency and he said, “Well, we know your work and what we would like you to do is to look at some escape communities. There were several communities in 1918 that completely escaped the Great Pandemic of 1918. And the reason that we would want to look at this is that we are trying to figure out what we can do to protect our men and women in uniform to avoid a potential worst case scenario pandemic.” And so I chuckled to myself and I said, “Well, Doctor, history doesn’t really work that way and I am not sure that is the study you’d like to do.” And he said, “No, that is precisely the study we want to do.” And I hemmed and hawed a little bit more and I tried to get out of it. And then finally I said something to him that I say to lawyers when they call me to testify. I never do, but I always say, “Hey, you know I’m very expensive.” And then with lawyers, that always ends the conversation. This time the man from the Defense Department said, “Professor, we are the Defense Department. We have trillions of dollars at our command.” And so I paused and I said, “Well--hang on. Let me get Dr. Markel to the phone.” And that began basically the work that I will be talking about today.
Although the possibility of a devastating influenza pandemic akin to the one experienced in 1918 gives most of us reason for pause, if not the outright shudders, the theoretical, practical, and intellectual questions raised by such a crisis are fascinating to say the least. What would we do if faced with the widespread human-to-human transmission of H5N1 or some other novel influenza virus variant? How would our medical system cope with the burgeoning numbers of cases needing immediate attention? How would public health agencies in the federal, state, and local levels respond? And how would the less developed nations of the world cope with such a crisis? What might be the economic, political, and social ramifications of such an event? These and so many other critical questions boggle the mind and yet we must, and hopefully will, develop a framework to help us come to some consensus about how to approach this and other microbial threats looming in the distance today.

And yet, most of us, regardless of the intellectual discipline we affiliate with, are rather uncomfortable making bold pronouncements and strategies because there is so little practical data or experience to work with. This, I think, is where historical inquiry can be of some value given that we simply do not have that much solid data on the means of mitigating or containing, worst case scenario, influenza pandemics, in our modern era. I will discuss why exploring the historical record of the 1918 pandemic may help to unleash a body of clues and suggestions. And just parenthetically, I am sure
most of you know this, but in 1918 anywhere from fifty to one hundred million people died of influenza. The attack rate was twenty-five to fifty percent of all people who encountered it got the flu, and the mortality rate was about two percent. If you compare that to seasonal flu, where there is about five hundred thousand deaths worldwide and the death rate is zero point one percent at best, so we are talking about a worst-case scenario. And the 1918 pandemic is probably the worst pandemic in human history.

Most compelling to me as a historian of infectious diseases is that the 1918 flu pandemic provides with appropriate retrieval methods, perhaps the largest database ever assembled in the modern post-germ theory era on the use of non-pharmaceutical interventions to mitigate pandemic flu in urban centers. Now that fancy term, non-pharmaceutical interventions, I will get into in a moment. The key, however, is extracting this data in a rigorous and scholarly manner from the historic—from a wide swath of archives, libraries, microfilm reels, documents and so on that are literally scattered across the United States. Perhaps more compelling to policy makers is the question in experiential data of how large numbers of people respond when a pandemic appears, but vaccines and antivirals are neither affective nor widely available. History suggests that when faced with such a crisis, many Americans and more formerly American communities will adopt in some form or another what they perceive to be affective social distancing.
measures and other NPI. And this is precisely what the nation did in 1918 resulting in a wide spectrum of outcomes and experiences.

So how can historians, mathematical modelers, epidemiologists, statisticians, and public health professionals make some sense of and exploit this historical data to inform decisions today on how best to employ or discard various NPI strategies? And can we or how can we evaluate their costs and benefits in a manner that includes a polyset of social, legal and ethical menses?

Before I get to that, I would like to give you some background on contemplating pandemics and several historians have been thinking very hard about epidemics and pandemics over the last several decades. One particular model that I liked was articulated by Charles Rosenberg who is a wonderful historian of American medicine and he constructed something that he calls the Four Act Model of an Epidemic. And he is really basing it not just on his reading of a wide variety of historical sources on epidemics, but a novel that is probably well known to everyone in this room, The Plague, by Albert Camus. Now I am very jealous of Albert Camus. He writes beautifully and I have been studying epidemics for a long time and this guy has got it down perfectly. It is actually probably the most perfect document if you want to read about epidemics. It is something that I always assign to medical students who are in search of information even though it is a novel, not a historical source.
But you will remember in the Act One, is what Rosenberg calls progressive revelation. If you remember the book, it has one of the most remarkable, albeit, disgusting openings in all of literature. When leaving his surgery on the morning of April 16, Dr. Bernard Rieux felt something soft under his foot. It was a dead rat lying in the middle of the landing. On the spur of the moment he kicked it to one side and without giving it a further thought, continued on his way downstairs. Only when he was stepping out onto the street, did it occur to him that a dead rat had no business to be on his landing. Well, that is exactly how the most epidemics or pandemics begin--with an odd occurrence that you do not give much thought to it. Something is afoot, no pun intended, but you really have not put things together. And that is a real problem because the time between putting that first event together with what might happen, is the time when the microbe can multiply and can infect other people.

This brings to mind the second act of an epidemic. Now you have more cases going on, but you still do not know what is going on and we call this managing randomness. This is a part of a painting called the Triumph of Death which is about the Black Plague of Europe by Pieter Bruegel, the elder. And how does the society make sense of these random events of people developing terrible symptoms and dying and new people developing those symptoms as well? What is in their own framework of understanding? What other beliefs of God or of science and what have you, and how these
belief systems work, have a lot to do with how people put together or figure out what is going on?

The third act that Rosenberg talks about is something called negotiating public responses. And so once an epidemic is recognized, the public typically demands collective action of some kind. And the history of epidemics is littered with tales demonstrating the importance of bold and decisive leadership and the costs of ineffective or incompetent crisis management. And as many a student--historians of the tug of war between the public and those charged with protecting their health have noted that the operative word in public health is public. So in those efforts that fail to generate a strong consensus among the multitudes constituting a community which takes into account cultural values and attitudes, social and class hierarchies, economical and political imperatives. If you don’t do all of that, very little is accomplished in any attempt to reign in disease. In fact, sometimes you have people working at cross-purposes because they are offended by your actions.

The fourth act, subsidence and retrospection, is perhaps the most frustrating to those of us who study epidemic or work in the field. I have this quote here from T. S. Eliot’s, The Hollow Men. “This is the way the world ends, not with obeying, but with a whimper.” And that is precisely how most pandemics end. People forget. There is something I call profound amnesia. Let me illustrate. A few years ago when the SARS Epidemic was brewing,
it was all SARS all the time. Now, for most people, it was either annoying or troubling. For me it was great business and so it was really quite remarkable how many people were calling me at that moment. And I was on the MacNeil/Lehrer Report and I was making this particular point. I said, “What is going to happen in the future?” Now historians by definition are uncomfortable predicting the future, but I hazard a guess and I said, “I think the SARS Epidemic will end in eight, ten, or twelve weeks, but what bothers me most, Mr. Lehrer, is that everyone will forget about it and that we won’t take the steps we need to prevent the next one from happening.” And I will illustrate this. If I call you twelve weeks from now and say, “Jim, I want to get back on the show to talk about SARS,” he will say, “That is history.” I did that twelve weeks later. The SARS Epidemic was over and I never got through to Mr. Lehrer, so it was a nice experiment.

But of course, while this four act model is very intriguing, not all epidemics and not all pandemics subscribe to the strict narrative structure as prescribed by a four act claim. And so some of the work that I have done over the past couple of decades, is a model that I call the Light Motif Model of Pandemics. Let me go through some of these themes. These are themes or ingredients in the mix. They do not always appear in the same proportions and sometimes some of them or a few of them are not in at all, but you can pretty much count from epidemic to epidemic that you will see most, if not all of these themes.
The first one is that epidemics are almost always framed and shaped, sometimes advanced, sometimes hindered by how a given society understands a particular microbe to travel and infect others. So let us say, it was an epidemic of cholera—a pandemic of cholera in the early 19th century when the theory of the best medical science of the day thought that cholera pandemics were spread by measthmus(?), some type of polluted air that came from rotting organic material that somehow spread disease. Your approach to containing that epidemic would be very different than if you subscribed to the germ theory of—that explained that a particular microbe caused that disease. You might want to clean up the environment or the streets or what have you, but it would be a very different approach.

Another theme is the economic devastation typically associated with epidemics, could have a strong influence on the public’s response to a contagious crisis. Now let us face it, epidemics or pandemics cost a lot of money. If you close a seaport or an airport, if you stop convention traffic, if you order business closures, you cost a lot of money. SARS cost the world economy over sixty billion dollars. The projections on if there was a worst-case scenario flu pandemic tomorrow or next year, the worst-case scenario projections in America—the United States of America alone, would be six hundred to seven hundred billion dollars. That is just the United States. So it costs a lot of money and so you—if you are going to close things down, if you are going to restrict movement and so on, you want to be sure that you
are right for a lot of reasons beyond money, but that is one of them. And when people start losing money, they start complaining. And if they start complaining, they might not comply with the restrictions you might want to suggest.

The movements of people and goods and the speed of travel are central factors in the spread of a pandemic disease. This is a photograph of some immigrants coming into Ellis Island back in the good old or not so good old days when immigrants were coming. Twenty million came between 1880 and 1924. You had at least a seven to ten day lag time between the time those people left Europe and got to America or if they were coming from Asia, you had about a 14 to 20 day lag time. So that if they had a contagious disease en route, it might already manifest itself before they got to, in this case, an American port and you could diagnose them and or quarantine and isolate them.

Today when you can get from anywhere to anywhere else in less than 24 hours and then you can go somewhere else on a hub and travel quite extensively, we do not have that leg up. So germs are traveling in a much faster rate whether they travel in the bodies of human beings or in insects or on cargo or what have you.

Our fascination with the suddenly appearing microbe that kills relatively few in spectacular fashion, too often trumps our approach to infectious scourges
that patiently kill millions every year. This is an op--[inaudible] that I did for the New York Times a few years ago. It was during the SARS crisis and you can see the bigger squares, they are not to scale, but the bigger squares, tuberculosis killed two million a year, eight million cases. Malaria kills about a hundred every hour. Hepatitis B and so on and that variant in that very corner is SARS. Because of that date, that was about May 1--April 30th of 2003. There were only 353 deaths in about five thousand cases. By the end of the SARS epidemic, there was about 800 deaths in eight thousand cases. But we love the sudden and scary and we do not pay enough attention to the infectious scourges that are carting off literally hundreds of people every hour. In the last hour alone, fifteen hundred people, half of them were young children, died of some infectious disease. Most of them are TB, AIDS, and malaria, but do not forget diarrheal diseases as well.

Wide spread media coverage of epidemics is hardly new and it is an essential part of any epidemic. The press has been with us for many, many, many, many, many decades and they have been covering epidemics quite extensively during that time. And how they write those epidemics up plays a critical role and there is good reporters. There is not so good reporters, but how that information is spread about can have a real impact on your public health management.

The concealment of contagious problems from the world at large has often proven quite deadly in epidemics past. Now, most famous in recent times
was the SARS crisis. Now we knew there was--it came in retrospect we know there was cases of SARS in the Guangdong province of China for at least three months before the Hong Kong cases reported in early February of 2003. And yet for political or nationalistic reasons, they were concealed which gave the microbe a leg up in traveling and infecting other people, but this is hardly the first example of this. One of my favorite cases has to do with the cholera pandemic of 1892 which was a huge cholera pandemic and when it got to Hamburg, Germany, which was the largest port in the world--the largest seaport in the world, the German government simply concealed that they had cases and sent boat loads of people all around the world so that it spread further. They concealed the cases because they were afraid of the economic ramifications. You know, if we admit that we have a terrible cholera pandemic, no one will want to do business with us. It is kind of backwards reasoning because after a while, no one wanted to do business with the Hamburg port because they were afraid of getting cholera and that is similarly the case with China. China really had to clean up its act after SARS and be a lot more forth coming with surveillance data post-SARS than pre-SARS because they are part of the world economy as well and they wanted to maintain that role.

To me the saddest theme of epidemics, perhaps the saddest theme of epidemics throughout history has been the tendency to blame or scapegoat particular social groups. This is a cartoon from Judge Magazine in 1892,
you will see it is a Dutch immigrant and a Russian Jewish immigrant walking arm and arm with a shrouded figure and it is called Asiatic cholera and Uncle Sam is looking over the wall there quite frightened. Lest you think this is just an artifact of the good old bad old days, here are a couple of cartoons that happened during SARS, so the Great Wall of China being quarantined and a particularly offensive cartoon, bad Chinese takeout. We are not immune to blaming people and so-called socially undesirable groups have often born the brunt of this and that is particularly a problem, not just for the ethical or social reasons, but too you have consider that if a particular group feels scapegoated and blamed, they may not cooperate with you. And when you are talking about containing a contagious disease, if people are not working with you or do not trust you for whatever reason, that actually hinders the public health rather than helps it.

The study that we did last year that will lead to what I will talk about in a moment was these escape communities that I mentioned and this is just--the work of this is--the full report of this is on a website which is listed right on the slide and the shorter version of the report appears in the December 2006 issue of Emerging Infections Diseases which you can get online right now but there is the reference if you would like.

Several of the places that we looked at like Fletcher, Vermont, which is a tiny hamlet then as well as now, it had a population of about 750 people, but probably simply too small to really suggest they did anything. You know,
they did do some quarantine and isolation, but it was simply too small to make a lot of conclusions about it. By the way, Fletcher, Vermont, narrowly escaped a bad flu outbreak because they had local dances and one of the visitors to a dance was a soldier from Fort Devens outside of Boston, if you have read about the flu pandemic. That was one of the epicenters of the flu and it is just luck that this particular soldier did not have flu and did not infect the entire town of Fletcher, Vermont.

But a couple of other escape communities that we looked at Trudeau, TB Sanitarium and Saranac Lake, New York, and the Western Pennsylvania Institution for the Blind, had a remarkable period of escape from the flu and there is a lot of reasons. One, they shut themselves off, something that we call protective sequestration. I will talk about that in a moment. They literally close their doors from the outside world. It was a bit harder in Pittsburgh, which was a bad flu town. They actually closed their doors from the city proper. Saranac Lake was a bit more remote. But these places were already de facto quarantine islands, if you will. If you think about how people treated those with tuberculosis, they put them in sanatoriums far away from them and how people treated those with physical disabilities, being blind, handicapped, and so on. They were often in homes for the blind, for the crippled, for the ruptured, for the insane, and so on. So these were already separated places from society at large.
What work was more interesting actually was the United States Naval Training Station at Verba Buena Island in San Francisco and in Gunnison, Colorado, a mining town. The Naval Training Station literally shut itself off. It is right in the San Francisco Harbor. You can see the pilings in that picture are what becomes the Bay Bridge. That is a photography from the 1930s, but it is literally in you know, San Francisco, but in the harbor. But the Commandant shut the doors, so to speak, of Verba Buena Island three days—two to three days before a flu hit San Francisco, so there is no traffic from San Francisco or to San Francisco during an almost two month period of time. And all these sailors and their Naval officers who are on this island were basically flu free until they opened up the gates and then some cases started trickling in. Similarly, in Gunnison, Colorado, which was a mining town in the Rockies, the Public Health authorities closed the town, barricaded the roads with police officers manning the barricades, prevented the train from actually coming into the town proper without being inspected. People who did come into the town were quarantined for a particular period of time and so on. And indeed, for almost a four-month period of time, Gunnison was influenza free. This is a striking comparison to many of the towns that were surrounding it that had terrible flu outbreaks.

But the problem with protective sequestration is that it is a rather difficult thing to enact and so the best prescription that I could give the Department of Defense is that if you are a remote mining town or if you are in violent
run by a Naval Commandant, you should shut yourself off from all interaction with the world. That is not a prescription that you can really enact in many places in the United States today.

Now this led to the study that we are doing now for the Department of Health and Human Services as well the Centers for Disease Control and Prevention. And in a way it was a study I had hoped we would do a few months before when we were assigned the task for the Department of Defense. The reality is that there is hundreds of cities in the United States that had varying flu experiences. So if you read the grand sweeping narratives, the best selling books about influenza, it is all about the carnage that was brought on by this microbe and that hundreds of thousands of deaths in the United States alone. There are about six hundred fifty thousand deaths due to flu in America that year.

And yet, but we find when we take our microscope, our historical microscope and start looking at the individual experiences of these cities is that not every city had the same experience and some had better experiences. So the question is what did they do right or what did other cities do wrong? And what non-pharmaceutical interventions, quarantine, isolation, school closure, what worked and at what point should you pull those triggers and when should you release those triggers? Now here is the rub.
History is not a predictive science. It should not be looked at as an oracle of what is to be with all due respect to George Santayana, who said, “You know those who ignore the past are condemned to repeat it.” I love that because it is good job security for me, but it really does not work that way. History does not repeat itself in exact circles. There are cycles and a relicenses and of course history, I firmly believe, can inform the present and the future, but it does not provide a blueprint for what is to come. Moreover, there are lots of ways to extract historical data and many of them are wrong. Okay, this is a very complex data source. How do you look at this data?

There are certain terms that are used even in the very narrow historical framework of a hundred years that certain terms like vaccine mean very different things in 1918 compared to today. Terms like quarantine can mean different things. Where do you get the primary sources? So there is lots of secondary sources on deaths in various cities and of course just like a game of telephone operator, which I am sure everyone played as a child, as you get secondary tertiary, quaternary sources, you start getting the story changed a little bit. So how do you find the best data available? And that is really what our team at the Center for the History of Medicine has been doing. We have been scouring the National Archives, the Library of Congress, the University of Michigan libraries, and a bunch of libraries and archives around the country to find the best possible data that we can to figure out these questions.
You also need to be intimately familiar with the social, cultural, and intellectual history of the region and period under study and attempt to explain the differences than compared to today. In 1918, the United States is a very different country than in 2006, so we can talk about that during the question and answer period, but most people do not have automobiles yet, trains are the major means of long distance travel. There is rapid communication, but in the form of telegrams and for some people telephones. Newspapers are very active then, so there is good media communication. People live in a more of a cash economy so they are used to going to the bank everyday. There are no refrigerators yet, so people grocery shop on a daily basis or they need to buy cakes of ice to put things that are perishable. So there are all of these issues that need to be thought of and discussed when you think about comparing then versus now.

So the study that we are doing now for the CDC and that we are advising the White House, the Department of HHS, and the CDC which are struggling to come up with some set of guidelines of what we would do in a worst case scenario. So this is not a 1957 or 1968 flu pandemic scenario. Those were flu pandemics, but really not many more people died during those pandemics than would die during seasonal flu, about a half a million. We are talking about the worst-case scenario of a hundred million deaths worldwide, two percent mortality rate, and a twenty-five to fifty percent
attack rate. We are also talking about the other things as well, but this is the worst-case scenario.

And so the thought is--let us look at 45 Americans cities and we wanted to look at as many cities as we can to increase the power of our statistical analysis and try to look at these things of what they did. These are the 45 cities by the way that we are looking at. But we are looking at these NPIs. Now what are they? NPI is a very fancy almost Orwellian term, but they include making flu reportable disease, isolating sick individuals, quarantining households with sick individuals, school closure, protective sequestration of children or adults, cancellation of worship services, and closure of public gatherings such as saloons, theatres, and so on, staggered business hours so you can decrease congestion on trams and public transportation, mandatory or recommended use of mask in public, closing or discouraging the use of public transportation systems, restrictions on funerals, parties, and weddings, restrictions on door to door sales, community wide curfew measures and business closures, social distancing strategies for those who encounter others, public health risk communication measures and declarations of public emergencies.

Now the rationale of course, of all of these was to help mitigate community transmission of flu. We do not know yet, we are getting close to it, of precisely how much mitigation, if any, was achieved. In fact, I wrote this before I spoke to our statistician today. We are actually getting very close to
finding that some cities had quite a bit of mitigation. And what is intriguing about this is that no systematic study--lots of people are talking, “Well, back in 1918 this happened or what have you,” but no systematic study of the NPIs taken, the case incidence and death rates during 1918, and what occurred in these populated centers really exists. This is a glaring lacuna both in the historical literature as well as in the public health literature.

Now we are working from the hypothesis that coordinated layered strategies of NPIs taken early during the 1918 pandemic may have helped some cities experience lower death and case incidence rates as compared to those with less organized or less comprehensive strategies. Now we fully appreciate that NPIs are not expected to prevent a pandemic or to have any impact beyond the time of their implementation. Instead, the primary purpose of these strategies is one, to reduce the attack rate at peak incidence, two, reduce the death rate at peak incidence, and to shift the epi curve to the right, thus delaying the impact of the pandemic.

Now think about this. This is I think remarkably exciting because if you could delay the rise of cases and the rise of deaths and flatten the epi curve and lengthen it over a period of four to six months, that would be enough time to create vaccine in the 21st century as well as it would not lead to a glut of hospital beds or lack of or rather a glut on the hospitals or other critical infrastructure. So if you have a rapid peak, your hospitals are filled to overflowing and not only can you not take care of the flu patients, you
cannot take care of the other patients who we take care of on a daily basis who have a variety of other diseases. The conventional wisdom is that these NPI interventions have little if any effect on the United States during the 1918 pandemic because despite their use, virtually all United States communities were severely affected by this. But what the historical record is showing quite clearly is that some cities were more severely affected than others and indeed in terms of influenza mortality and morbidity rates, there is wide variants among these 45 cities. But the problem is that during the pandemic, the critical data that we would love to have that we would probably have if we were making a prospective study is not always there.

Take for example, case incidence data. So case incidence data varies from one city to the next and it is not always kept in the same way. So it is not nearly as reliable as we would like. With that data, it is a lot better, but there is a lot of secondary sources from the 1920s that sort of changed the data or made mistakes in terms of tabulation and so that you can get very different results if you do a statistical analysis in terms of the ranking of each city and which city was more successful more than others. Fortunately our intrepid crew of researchers have found what I call the bedrock of death data for the flu pandemic. The National Census Data kept very good death data for the several years before the 1918 pandemic and during the 1918 pandemic for both pneumonia and influenza and so that we can actually construct an excess mortality rate and look at the death rates and suggest that it would be
about seven to ten days after the case, roughly, if you think that is how--the average time people who had flu and died of it.

The outcomes of our study will be, as I said, the shape and slope of the epi curve, the death rate at the peak of mortality, and the time factor between initiating NPI and the height of the peak. Another source that we have been using are newspapers and this is very arduous work because you have to go through literally hundreds if not thousands of microfilm reels to extract each article. But it is really a remarkable source. Now far be it for me to ever say everything in the newspaper is true, especially if it is under my byline, I would be very nervous about that. But using newspapers to find out the days when the strategies--these triggers were pulled on and off is probably the most reliable source that we have. In fact, far more reliable than municipal reports and things like that. So we have been looking at every--about--there are 45 cities we have been getting two or more newspapers per city so that we can also evaluate in terms of circulation, social demographics, as well as political slant of that newspaper may have, but also to get these nuts and bolts kind of numerical quantitative data that we can measure some of these things.

The questions that we are asking is first, can an orchestrated strategy of layered NPI applied early and kept in place for appropriate periods of time lower the R0, the reproductive rate of an epidemic, flatten and lengthen the epi curve or even delay the appearance of an epidemic? Second, is which
NPIs appear more effective than others? What factors promoted or detracted from the effectiveness of NPIs? For example, mandatory NPIs are not always as effective as voluntary NPIs. Did the timing and layering or a combination of these NPI play a role and is there a relationship between when the NPI were ordered, the number and the type of NPI used, the duration of these NPI, and the compliance among those so ordered? Were these NPI enacted smoothly, haphazardly, belatedly, or with inadequately enforced compliance or affective or ineffective leadership? And was there a communal push back or in successive waves? There were four waves to the 1918 pandemic, something that we call epidemic fatigue. So let us say the second wave of the pandemic was the most deadly in terms of morbidity and also in terms of cases as well.

The third pandemic which followed right on its heels, people were a little bit tired of being ordered to not go to saloons or movie theaters and so on. So it is very difficult to get people to adhere to restrictions when they last more than a week or two, let alone twelve weeks and then you repeat them only a few weeks after that. And in today’s hyperactive world, I think people are even less patient than they were in 1918 so that may be a day or two is when the natives might start getting restless.

And finally, what broad historical lessons can we learn as we develop pandemic strategies today? Now there is a wonderful book by an epidemic(?) historian Alfred Crosby called America’s Forgotten Pandemic -
the Influenza of 1918. I still think that is the single best one volume account of the 1918 pandemic and he noted that in human terms, the pandemic was not one overarching story, but instead thousands of separate stories with different origins and outcomes from the flu victims, their families, and their communities.

Now while we do not have any auricular commandments from this work, what I can tell you is that each city not only had a different experience, that there are different things that you can do that might allow you to prevent—or not prevent, but contain or mitigate an epidemic. Now I am not going to go through all these cities very closely. I can do this in the question and answer period, but I think I will skip through them a bit, but let us take a look for example, at Pittsburgh. And what you see, Pittsburgh did not have a very good experience with the flu pandemic. It was a large city. It was an industrial city. It was racked by political class and racial tensions and what this shows is the death curve, the death epi curve during the second wave of the pandemic as well as the various NPIs that were used, and how long they were used for. Those are the bars on the bottom and what you see, for example, is that they applied many of these, particularly school closure, very late in the pandemic after flu already started to rise. School closure by the way, is one of the things that the CDC is most interested in as a flu mitigation strategy for the 21st century. It is a very problematic mitigation strategy because so many of us rely on the fact that our children are going to
school. There are many dual working parents or single parent homes, so that it creates a problem in terms of daycare. There are millions, ten to twenty million children everyday who get their basic nutrition in school lunch programs so that needs to be accounted for as well. And yet on the other hand, it is very intriguing to think about closing schools because anyone who has spent any time in a daycare facility or a kindergarten room or a first grade room knows that young children do not have the best respiratory etiquette. They sneeze on each other. They cough on each other. They blow their noses on each other and so on and when you think about high school kids, they have a different form of bad respiratory etiquette so that closure of schools might be something to think about.

I want to go quickly but, Denver for example, which had an early public closure of school. You can see a bimodal curve. Now it did not do all that well. It had one of the worst records in the country in terms of morbidity and mortality, but this bimodal curve is very interesting because it suggests that if you pull the trigger early enough, you might get the diminution of cases in this. And then when they released the trigger you can see when they released the trigger you start having cases rising up again so the city actually serves at its own control about what might have happened with these NPI strategy.

Newark had a disastrous experience. As you can see it had a very sharp curve and one of the reasons has less to do with what we can find in the
quantitative data and it really explains--or illustrates the importance of qualitative historical analysis is that if you start looking at the way Newark governed itself, there are quite a lot of infighting between the mayor and public health department, and the State of New Jersey’s Public Health Department, so they could never agree when to pull the triggers, when to release the triggers. It was based in just chaos and so it really brings up an issue is that when you have your leaders fighting and against one another, it is very difficult to orchestrate a good strategy of disease containment. Chicago is a very similar story as well.

But Milwaukee on the other hand, which is one of the healthiest cities in the country at that time, had a very low incidence and again has the same bimodal kind of a curve that goes exactly with these public closure order and school closure orders. So it is very intriguing as we are coming up with guidelines today. The best city in the country, bar none was St. Louis. Now, St. Louis really benefited from a very sharp public health officer named Starcloth who ordered school closure and public closure orders almost immediately when the first case of flu struck and kept them in place for along period of time so they had a very well coordinated and early proactive local response. And if you look at their curve, it is a bimodal curve as well, but it is very low. It is below forty cases per hundred thousand so that is very intriguing.
Well, based on the data that we have collected so far and we will be reporting this out in the next several weeks and hopefully you will be hearing about it. We have presented some of this data already to the Institute of Medicine and we will be presenting it at a CDC stakeholder’s conference and then we will be preparing it for publication. Is that--the first issue is that long standing investment in public health infrastructure, experience with epidemic response and the building of local trust by health officers appears to have facilitated NPI implementation in every city that we looked at. So that compatible and smooth relationships between key authorities such as the mayor and the health commissioner, appears to have facilitated the coordination and implementation of NPI, but that does not demonstrate the NPI themselves were affective or appropriate, nor did these amicable relationships always guarantee ultimate success. Sometimes the microbe gets an upper hand as well.

Conversely, the implementation of NPI can be derailed by political and administrative tensions and the inconsistent behavior of key authorities such as the mayor or the health commissioner. Other quantitative observations that while many scholars have focused on the cumulative death rates or the overall experience of individual cities with the flu pandemic, we believe this approach is less useful when assessing the potential efficacy of NPIs since it appears that their most extensive application occurred in the weeks between October and December of 1918, what is called the second wave of the
pandemic. Cities with the bimodal curves, like St. Louis, Milwaukee, Denver, that appear well tied to NPIs may have had similar cumulative death rates as cities that did not implement the da--the same menu of NPI or even at all, but this does not suggest however, that the NPI had no impact. Quite the contrary. It may mean that for NPI to have an impact, they must be applied early in a--and in a sustained way. And that to me is the sixty-four thousand dollar question, because it is a very difficult situation to find yourself in to pull that trigger if you are the health officer of the community. If it is too early, people complain because people do not like to be restricted, money can be lost and so on. If it is too late, people die. So how do you hit that sweet spot, so to speak, is a very, very difficult issue.

It is interesting to note that based on preliminary observations of St. Louis, Milwaukee, and even Denver, when compared to many of our other cities, that the NPIs may have lowered the initial peak and were followed by a second delayed peak after some of the interventions were rescinded. Unraveling the complexity of these qualitative and quantitative observations is the challenge of this remarkably large study that we are doing with the CDC as we continue to systematically examine the historical record. For example, time does not permit me to delve into the nuance difference in public health, administrative structures, or political infighting or collaboration, the social responses to these NPIs and other critical issues such as immigrant communities or other ethnic communities might have an
impact on how these things played out. Rest assured, we are looking at this for our broader study. But when completed, we believe that the final report that we produce as well as a web-based influenza archive that we are going to produce will constitute the single largest database on NPIs ever taken during a human pandemic. And it will be easily accessible for scholars to look at and to challenge our observations and our interpretations.

While I spent a great deal of time discussing the historical lessons of pandemics during this last hour as well as how they can impact on society at large, I am very eager to discuss your questions and queries about this work and what we might do to better protect the nation’s health. I would also like to conclude by noting the remarkable change over time that makes a future influenza pandemic so strikingly different from those of the past. Specifically, this is essentially the first pandemic in human history that we have had some semblance of advanced warning and hence, the opportunity to prepare. That is truly a great change over time and when you combine that with the advances in virology, surveillance, rapid communications, epidemic modeling in other fields, there really is the exciting hope that we can apply these methods to a pandemic’s rapid mitigation if not containment or outright prevention. All of the light motifs that I mentioned were still at risk for them coming up—for them rearing their ugly heads and a host of other bad human behaviors or panicked human behaviors. But I have always been a great proponent rather not of panic but of informed concern. When
you panic in the midst of a crisis, rarely do good things or good strategies come to play. But when you plan for a crisis in--before it occurs, it does not mean you are always going to be right in what you predict, but you are a little bit better prepared to handle those issues as they come up. Please be assured that as a pandemic does--if a pandemic does occur, there will be no blueprint that can be religiously followed and it will have to be changed by day by day just as all of us would do at a patient’s bedside. I mean I look it as public health as really the doctor patient relationship at large. So if you are at a bedside seeing a patient and the data is one--presents one picture and then the next day things change, you change your treatment plan. And again with a public health situation, we may have to change our treatment plan day by day, but with open and honest communication I really do believe that can happen.

And so I guess I will close and I am historically optimistic and hope the lessons from the past and the present can facilitate productive, ethically, and socially appropriate strategies that will mitigate the microbial threats that sadly but inevitably loom on our horizon. Thank you very much.

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